Policy, Research, and External Affairs

WORKING PAPERS

Agricultural Policies

Agriculture and Rural Development
Department
The World Bank
March 1990
WPS 375

Regional Disparities, Targeting, and Poverty in India

Gaurav Datt
and
Martin Ravallion

To have an impact on national poverty, attempts to redistribute resources from richer to poorer states or sectors must be supplemented by interventions to reach the poor *within* regions or sectors — to reduce the costs borne by the poor in donor regions and enhance benefits to the poor in recipient regions.

Policy, Research, and External Affairs

WORKING PAPERS

Agricultural Policies

This paper — a product of the Agricultural Policies Division, Agriculture and Rural Development Department — is part of a larger effort in PRE to better understand the real world constraints facing policymakers in attempting to alleviate poverty in developing countries, with a view to designing and implementing more effective policies in the future. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Cicely Spooner, room N8-039, extension 30464 (41 pages with figures and tables).

How much can India reduce poverty nationwide by manipulating the distribution of income between regions or sectors?

What is the overall effect on the poor of targeting resources toward the poorer states of India — or toward the generally poorer rural sector?

The answer to these questions is far from obvious, report Datt and Ravallion. Given real constraints on policy changes, it can be argued that the costs (to donor regions) and the benefits (to recipient regions) of regional policies will tend to be borne widely *within* regions.

Some benefits are likely to leak to the nonpoor in recipient regions, and some costs to the poor in donor regions. And with benefits targeted to the agricultural sector, the costs to the urban poor may be higher than the benefits to the rural poor can justify.

Datt and Ravallion's simulations suggest that the quantitative potential for alleviating national poverty through purely regional redistributive policies is small. Even assuming no political problems, the maximum impact on poverty is no more than could be achieved simply by giving everyone a uniform (untargeted) windfall gain equal to about 1.5 percent of India's mean consumption. And other considerations — including increased migration to areas of higher benefits — make it unlikely that the maximum impact will be attained in practice.

Greater alleviation of poverty requires supplementary interventions that reach the poor *within* regions, by reducing the costs borne by the poor in donor regions and enhancing benefits to the poor in recipient regions.

Produced at the PRE Dissemination Center

Regional Disparities, Targeting, and Poverty in India*

by
Gaurav Datt
and
Martin Ravallion

Table of Contents

* Paper presented at the IFPRI/World Bank Poverty Research Conference, October 1989. The paper draws on results of an ongoing World Bank research project, "Policy Analysis and Poverty: Applicable Methods and Case Studies" (RPO 675-04), based in the Agricultural Policies Division of the Agriculture and Rural Development Department, Policy, Planning, and Research. The authors wish to thank Michael Lipton, Eric Thorbecke, and conference participants for useful comments.

1. Introduction

The extent of India's regional and sectoral disparities has been an issue since at least Independence, and this concern has been partly motivated by a desire to alleviate poverty.[1] For example, India's Finance Commissions (including the most recent Ninth Finance Commission) have used a "poverty criterion" for disbursements of public revenues to the states.[2] The World Bank has also recently advocated changes in the center's revenue sharing arrangements so as to target resources toward poorer states of India in the context of an overall poverty alleviation strategy. Advocates of policy reforms favoring the agricultural sector have also pointed to the fact that levels of poverty are generally higher in rural areas.

The targeting of development resources toward poorer regions or sectors in preference to richer ones has seemed an attractive policy option in India, as elsewhere. Partly this reflects the informational constraints facing policy makers in developing countries when attempting to identify and reach the poor,[3] but it clearly also reflects political constraints inhibiting redistributive possibilities within regions or sectors of an economy. Given these constraints, the question remains: just how much impact on aggregate poverty is possible by manipulating the distribution of income between regions or sectors?

The answer is far from obvious. It can be argued that, given real constraints on policy changes, the costs (to donor regions) and benefits (to recipient regions) of regional policies will tend to borne widely within regions. Some leakage of benefits to the non-poor in recipient regions, and of costs to the poor in donor regions, is probably unavoidable. Clearly, the existing constraints on redistributive

possibilities in most developing countries will diminish the poverty alleviation impact of direct policy intervention. However, not even the qualitative effect of regional/sectoral policies is clear. Take for example, the poverty alleviation case for policy reforms aimed at giving a "pro-rural" emphasis in sectoral policies. Granted the rural population is (as a rule) poorer on average. But it may also be the case that the inter-sectoral redistributions associated with the policy reform carry a heavier burden on the urban poor, than the concomittant gains to the rural poor can justify. When we are unable to avoid the urban poor bearing costs of policy reform, and are unable to effectively target the benefits to the rural poor, we may well find that eliminating the "urban bias" in past sectoral priorities actually increases aggregate poverty.

Our aim in this paper is to explore the implications of regional and sectoral disparities for national poverty, and the case for inter-regional redistributive policies. We address the follcwing questions:

(i) How much do regional disparities in average living standards contribute to aggregate poverty in India?

(ii) Under what conditions can aggregate poverty be reduced by transfers aimed at reducing disparities in average living standards between regions or sectors?

(iii) Are those conditions plausible for India and, if so, how much impact on poverty in India can be expected from this type of policy intervention?

The paper's objectives are modest in several ways, and some caveats are called for concerning the policy implications of our analysis. First, we will be concerned only with what may be called the direct or first-round effects of regional redistribution. Thus, for instance, we do

not consider possible effects through the location decisions of households. Migration responses are likely to reduce the poverty alleviation impact, assuming that it is the non-poor who are in the best position to evade regional redistribution by migration. Similarly, our analysis does not consider general equilibrium effects on incomes and prices within regions.[4] It is unclear in what direction this would affect our results.

Second, we will ignore some of the constraints on the regional policy problem which may become binding in practice. Probably most importantly, we do not consider "political-economy constraints" on the centre's redistributive powers across regions. For example, it may be politically unfeasible to levy taxes on certain regions beyond some point. Such constraints will reduce the maximum poverty alleviation impact of regional redistributions when compared to the attainable outcome without those constraints, thus leading us to err on the side of overestimating the poverty alleviation potential of regional redistribution. The omission of political-economy constraints is probably less worrying when discussing small redistributive reforms (when the constraints may rarely be binding) than it is when examining optimal allocations which may involve large transfers.

The following section examines the above questions in the abstract. It describes how the contribution of regional disparities in average living standards to aggregate poverty can be quantified. It also considers the effects of certain stylized redistributions from "rich" to "poor" regions or sectors on aggregate poverty. We discuss how the poverty alleviation case for regional redistributive policies depends on intra-regional distributions and how they are affected by inter-regional transfers.

The paper's empirical results are presented in Sections 3 and 4. Section 4 discusses our data from India's 38th Round National Sample Survey (1983) and what it shows about regional disparities, and the regional profiles of poverty. Section 4 then presents our simulations of the effects on aggregate poverty of existing regional disparities, and the effects of regional redistribution in India, drawing on the theoretical results of Section 2. The final section summarizes our conslusions.

2. Regional Disparities and National Poverty

This section presents the theoretical results that we will need to answer the three questions posed in the Introduction. We first consider the contribution of regional disparities to aggregate poverty, and how that may be measured. We then ask the comparative static question: will small reductions in those disparities while preserving the national mean decrease aggregate poverty? Finally, we will consider the question of how much impact on poverty can be expected from reducing or eliminating regional disparities.

The national poverty level can be thought of as a function of three factors: regional disparities in average living standards, intra-regional inequalities, and the national mean living standard. The contribution of regional disparities alone can be quantified by estimating the aggregate poverty level that what would obtain if mean income levels were fully equalized across regions while holding the other two factors constant, i.e., maintaining the same overall national mean and the intra-regional distributions. We shall term this "the partial contribution of

regional disparities", so as to emphasize the fact that the other relevant factors mentioned above are being held constant.

There are a number of reasons to be cautious in drawing policy implications from such an experiment. For example, an enforced equalization of regional means may well entail some sacrifice in the national mean (to the extent that resources are constrained from flowing to regions of higher productivity). Nor is the equalization of regional means holding intra-regional inequalities constant likely to be informationally feasible from the point of view of the central government; to implement the multiplicative transfers needed for pure regional redistribution the government would need to know each person's income. That is very unlikely. However, quantification of the <u>partial</u> contribution of regional disparities to national poverty is at least the obvious first step in quantifying their <u>total</u> contribution under more realistic assumptions about the induced effects on other determinants of aggregate poverty. Later we shall consider the effects of small regional redistributions under somewhat more realistic assumptions.

Writing poverty in region j as a function of the mean income and the parameters of the Lorenz curve for region j (denoted by μ_j and the vector L_j respectively), the existing aggregate poverty is:

$$P = \sum_{j=1}^{m} w_j P(\mu_j, L_j)$$

where w_j is the share of region j in the total population of m regions. (We follow recent literature in assuming a class of additively separable, population weighted, poverty measures. Specific examples are discussed later). If all regional means were to be equalized, while retaining the

same national mean and intra-regional distributions, then aggregate poverty would be obtained as

$$P^* = \sum_{j=1}^{m} w_j P(\bar{\mu}, L_j)$$

where

$$\bar{\mu} = \sum_{j=1}^{m} w_j \mu_j$$

The contribution of interregional disparities in average living standards to aggregate poverty is then given by $(P-P^*)/P$. This is estimated for India in section 4.

Rather than equalizing regional means, consider instead the effect of small reductions in regional disparities on aggregate poverty. Again this will depend in part on how inter-regional redistribution alters intra-regional inequalities. That will depend on the way in which the redistribution is implemented. For example, lump-sum transfers to or from all residents of each region would reduce inequality in recipient regions, and raise it in donor regions. But the aggregate outcome for the poor remains unclear even if one considers a "pure" form of regional redistribution based on multiplicatively absorbed transfers which do not alter relative inequalities within regions. Poverty will decrease in recipient regions, and increase in donor regions. The aggregate outcome will then depend on whether the incremental gain to the poor in the recipient region exceeds the loss for those in the donor region; this will depend on both the regional disparities in average standards of living and on any disparities in intra-regional inequalities. We shall make these observations more precise in this section, so as to allow an analytically

tractable characterization of the conditions under which regional disparities can be said to contribute to aggregate poverty.

Consider the situation in which the reduction in regional disparities takes the form of lump-sum transfers, which are uniformly levied on, or received by, all persons in a given region. This is termed "additive absorption." Thus, the transfer paid or received by an individual is solely determined by his/her region of residence. An attraction of this case is that it does not assume that the government knows anything more than each person's region of residence and is, thus, informationally feasible from the point of view of the central government. However, it may be argued that multiplicative transfers are more feasible politically, at local level, insofar as they do not involve any change in intra-regional inequalities. It may also be argued that the same local political-economy factors (endowment distributions, local tax powers, the social preferences of governments, etc.), which determined initial intra-regional distributions will operate persistently to preserve those distributions. Thus there are good arguments for considering both additive and multiplicative absorption.

The outcome will also depend on how poverty is measured. We shall consider various members of the Foster-Greer-Thorbecke (FGT) class of measures. The level of poverty in the ith region is denoted $P_{\alpha i}$ for the parameter $\alpha \geq 0$. The well-known headcount index of poverty (proportion of people who are poor) is the FGT measure for $\alpha=0$. For $\alpha=1$ we obtain the FGT version of the poverty gap measure (mean income shortfall as a proportion of the poverty line), and a recently popular distributionally sensitive measure of poverty is obtained by setting $\alpha=2$. The latter is our preferred measure, as it satisfies Sen's (1976) Transfer Axiom (in that transfers

from a poor person to someone who is poorer will decrease measured poverty). An advantage of the FGT class of measures in this context is that they are additively separable, so that national poverty is simply the population weighted mean of the regional poverty levels. (This does not hold for Sen's own index).

The necessary and sufficient conditions for determining the poverty effect of additively absorbed lump-sum transfers between regions can be summarized as follows:[5]

> **Proposition 1** (Additive Absorption): The aggregate headcount index ($\alpha=0$) will decrease when a small additively absorbed transfer is made from region j to region k if and only if $f_j(z) < f_k(z)$ where $f_i(z)$ denotes the probability density function of income in region i=j,k as evaluated at the poverty line z. For other measures in the FGT class ($\alpha \geq 1$), poverty will decrease if and only if $P_{\alpha-1j} < P_{\alpha-1k}$.

Figures 1 and 2 illustrate how the national headcount index of poverty is affected by additively absorbed redistribution between hypothetical "urban" and "rural" sectors which we assume (for convenience) to be of equal size. Each person in the rural sector receives an amount x, which is transferred from each person in the urban sector. Distribution functions are thus displaced horizontally (to the right for rural areas, to the left for urban), and by an equal horizontal distance at all points. But rather than draw this explicitly, we can imagine shifting the poverty line; for example, if a proportion F(z) of the rural population were poor initially, then this will fall to F(z-x) when each person receives x. In

Figure 1: Effects on aggregate poverty of urban-rural redistribution
(Poverty line less than mode)

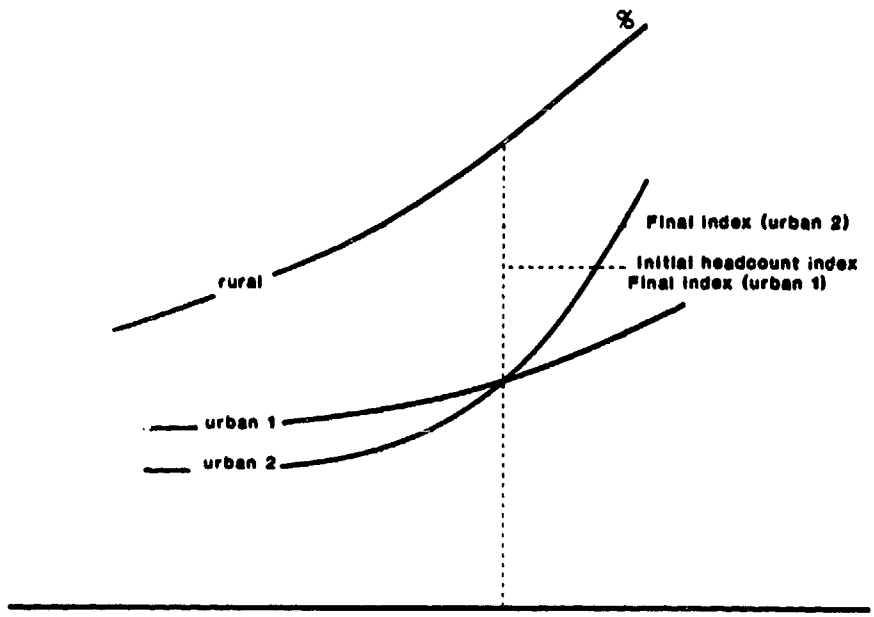


Figure 2: Effects on aggregate poverty of urban-rural redistribution
(Poverty line greater than mode)

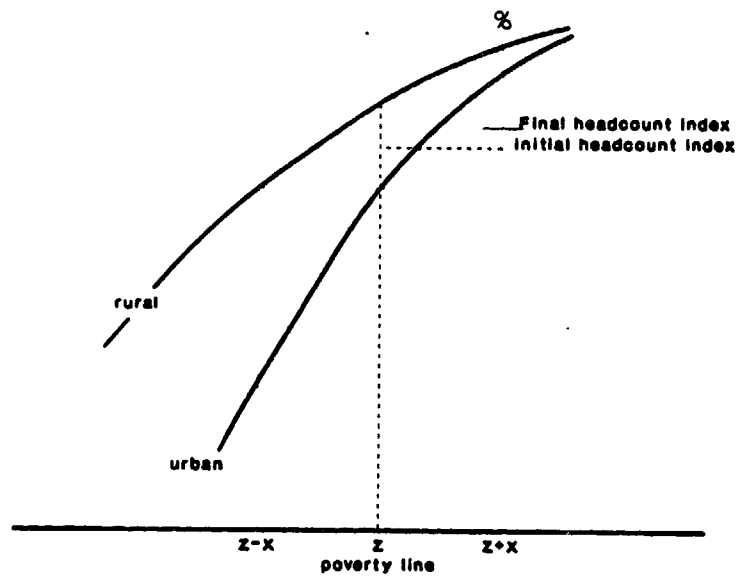


Figure 1 the income distribution functions are drawn convex from below, implying that (for the usual unimodal density) the mode is above the poverty line. Two possible "urban" distributions are considered, generating the same initial poverty level, but different final levels. The "urban 1" distribution is "flatter" at the poverty line (implying a lower density) and so we find that the aggregate headcount index falls as a result of the redistribution in favor of the rural sector, as claimed in Proposition 1. Another way of interpreting this result is by noting that the "urban 1" distribution has a similar Lorenz curve to the rural distribution (as evident from the fact it is drawn as a roughly proportional horizontal displacement of the rural distribution). And so, given that convexity holds, the transfer from urban to rural sectors decreases aggregate poverty. By contrast, the "urban 2" distribution is considerably more inequitable than the rural distribution, with the consequence that redistribution in favor of the latter sector now <u>increases</u> aggregate poverty; this follows from the fact that the "urban 2" distribution is more dense (has "steeper" slope) than the rural distribution at the poverty line. Figure 2 illustrates how the same outcome is achieved if the poverty line is in a concave segment of the distribution (the poverty line is above the mode) and relative inequalities are similar within sectors; in this case, transfers from the urban to the poorer rural sector increase aggregate poverty.

To illustrate the importance of the precise way in which regional redistribution is implemented, consider instead a "pure" regional redistribution such that transfers leave intra-regional inequalities unaffected; specifically, the Lorenz curve of each region's income distribution is assumed to remain unaffected by the transfers. In this

case, all transfers paid or received are directly proportional to household income per capita and the proportion transfered varies solely by region. Analogously to Proposition 1, we can summarize the necessary and sufficient conditions for such multiplicative regional transfers to alleviate aggregate poverty as follows:

> **Proposition 2** (Multiplicative Asbortpion): Small redistributions from j to k while preserving intra-regional inequalities will reduce the aggregate headcount index of poverty if and only if $f_j(z)/\mu_j < f_k(z)/\mu_k$ where μ_i denotes mean income in region i=j,k. For other poverty measures ($\alpha \geq 1$), the necessary and sufficient condition is that $(P_{\alpha-1j} - P_{\alpha j})/\mu_j < (P_{\alpha-1k} - P_{\alpha k})/\mu_k$.

Notice that when the donor has the higher mean, and a less dense distribution at the poverty line, the aggregate headcount index will fall. Thus, for example, redistribution from the "urban 1" sector to the rural sector in Figure 1 would still reduce aggregate poverty. It is, however, no longer clear that the opposite is true for the "urban 2" sector, or for the redistribution from urban to rural sectors in Figure 2; if the disparity in means is high enough (more precisely we require that $\mu_j/\mu_k > f_j/f_k$) then poverty will be alleviated.

Another way to understand this result is by noting that the headcount index is strictly convex in the mean, holding the Lorenz curve constant. This is proved in the Appendix where it is also shown to be true of the FGT measures for α=1 and 2. Thus, aggregate poverty is a strictly quasi-convex function of the vector of regional means, though that function is only symmetric if Lorenz curves are everywhere the same. By well known

properties of such functions, a reduction in regional disparities will reduce aggregate poverty if those disparities are initially large enough. Equalization will not, however, be optimal as a rule, and so there can still be transfers from "rich" to "poor" regions which increase aggregate poverty.

The above discussion has focused on the theoretical case for redistributing incomes across regions when that case is to be judged by the direction of the effects on aggregate poverty. It is of interest to quantify optimal regional targeting from this point of view. Of course, the sense in which poverty minimizing regional allocations are "optimal" is quite restrictive; poverty alleviation is unlikely to be the sole criterion for judging such policies. But we are still interested in the poverty minimizing allocation, because this is the appropriate benchmark for evaluating the potential for regional redistribution, in that it allows us to estimate the maximum impact that this type of policy could have on poverty. Trade-offs against other policy objectives will diminish our desire to attain that maximum, but we are still interested in its value. For example, given the fact that regional redistribution is a form of targeting under imperfect information, and that region of residence may be a highly imperfect poverty indicator, one may find that the potential for poverty alleviation by this means is modest. That can only be determined with precision by calculating the optimal (poverty minimizing) allocation.

Drawing on recent work one can readily characterize and calculate the optimal allocation of uniform lump-sum transfers for the P_2 poverty measure.[6] The necessary condition for a minimum of the aggregate value of P_2 is that P_{1i} is equalized across all regions, at given national income. It is also useful to have a monetary measure of the gain from optimal

regional redistribution. For this purpose, the equivalent gain from targeting is defined as the uniform (untargeted) lump-sum gain needed to achieve the level of poverty under optimal regional targeting (Ravallion and Chao, 1989).

3. Average Consumption Levels, Inequality and Poverty in India: A Regional Profile

Our main source of data is the National Sample Survey (NSS) 38th round survey on consumer expenditure for 1983 (NSSO, 1986). The survey gives the size distribution of per capita monthly consumption expenditures in urban and rural areas of different states and union territories. Our analysis relates to 40 regions in India, namely the urban and rural sectors of 20 states (see Table 1), accounting for 98.4 percent of India's total population (RGCCI, 1982).[7] Many of the following calculations were also performed on the data for the 20 states, not split into urban and rural sectors. The poverty reduction attainable through regional redistribution will generally increase with finer regional detail.

One important limitation of these data (in common with most other surveys) is that they only provide single cross-sections. Our analysis will thus be static. We do not consider possible effects of combining spatial and temporal redistributions; for example, transfers from the urban sector to the rural sector during lean seasons or poor crop years can be expected to have a greater impact on aggregate poverty than at other times.[8]

Price Deflators

The NSS data on consumption expenditures are, of course, in current local prices. In order to make inter-regional comparisons and evaluate aggregate poverty, it is thus necessary to adjust the nominal data for spatial variations in the cost of living. We use the following two price indices to express all regional expenditures in 1983 all-India rural prices:

i) The rural price index (RPI) for state j is defined

$$RPI_j = RPR_j \cdot \frac{CPIAL_j(1983)}{CPIAL_j(1973\text{-}74)} \cdot \frac{CPIAL_{AI}(1973\text{-}74)}{CPIAL_{AI}(1983)}$$

where RPRs are the rural interstate price relatives (ratio of rural prices in state j to all-India rural prices) for 1973-74 and are based on the Fisher regional price indices constructed by Bhattacharya et al (1980, Table 3a).[9] CPIALs are the Consumer Price Indices for Agricultural Labourers, as tabulated by the Labour Bureau, Ministry of Labour. It can be seen that the proposed price index simply updates the rural interstate price relatives for 1973-74 to 1983 using the CPIAL as the rural price deflator.

ii) The urban price index (UPI) for state j is defined analogously as

$$UPI_j = URPR \cdot UPR_j \cdot \frac{CPIIW_j(1983)}{CPIIW_j(1973\text{-}74)} \cdot \frac{CPIAL_{AI}(1973\text{-}74)}{CPIAL_{AI}(1983)}$$

where UPRs are the urban interstate price relatives (analogous to RPRs) and URPR is the all-India urban-to-rural price relative for 1973-74. Both UPRs

and URPR are derived from Bhattacharya et al (Tables 3b,4). CPIIWs are the Consumer Price Indices for Industrial Workers (Labour Bureau, Ministry of Labour); CPIIWs are constructed as state-specific simple averages over centers in each state and over months during the relevant period.[10]

The above two price indices are used to transform 1983 local-price values into 1983 all-India rural prices.

Mean Consumption Levels and Regional Inequality

Table 1 summarizes the relevant data. The following observations can be made:

i) The national mean consumption expenditure for 1983 is about Rs.116 per capita per month at 1983 all-India rural prices. At the state level, average consumption ranges from the lowest, Rs.90, in Bihar to the highest, Rs.163, in Punjab. Intra-regional inequality, as measured by the Gini coefficient, is low to moderate for most regions, ranging from about 0.18 in urban Manipur to about 0.36 in urban Tamil Nadu.

ii) Mean per capita consumption levels in urban areas are generally higher than those in rural areas, even after allowing for sectoral differences in the cost of living. At the all-India level, the difference is about 11 percent of the rural mean consumption. However, inter-regional variation in mean consumption levels is greater amongst the rural areas (of the 20 states) than amongst the urban areas.

iii) The Gini coefficient of per capita household consumption is generally higher in urban areas than rural areas, and it is significantly correlated with the mean ($r=0.37$; $t=2.5$) across the 40 regions.

Regional/Sectoral Profiles of Poverty

Tables 2 and 3 gives the FGT poverty measures for $\alpha = 0,1,2$ for each sector and state. The Appendix outlines how these poverty measures are calculated from the published grouped data. The measures are evaluated at two poverty lines, namely monthly per capita expenditures of Rs 76.65 (Table 2) and Rs 89.00 (Table 3) at 1983 all-India rural prices. The lower of the two poverty lines corresponds to the widely used Dandekar-Rath poverty line of Rs 15 per capita at 1960-61 all-India rural prices updated by the all-India CPIAL for 1983. The higher poverty line is obtained by updating the Sixth Plan poverty line of Rs 49.09 at 1973-74 rural prices by the consumer price index for middle rural population, developed by Minhas et al., (1987).

The motivation for using two poverty lines is not to compare the relative merits of alternative poverty lines or consumer price indices, but simply to examine whether the conclusions of our analysis are sensitive to the exact cut-off point used to define poverty. Our range of poverty lines appears to safely encompass the range of opinion on this issue.[11]

The following observations can be made on the results in Tables 2 and 3:

i) About 33 percent of the national population are deemed to have been poor in 1983 using the lower poverty line. This rises to about 44 percent using the higher line. For the lower poverty line, the 1983 poverty gap per capita (P_1) represents 8.1 percent of the poverty line, equivalent to Rs 6.20 per person in India per month, or about 5.4 percent of India's mean consumption per capita in that year. The poverty gap rises

to 12.3 percent, or about 8.1 percent of mean consumption using the higher poverty line.

ii) The prevalence of poverty is generally greater in rural areas. The rural sector accounts for about 80 percent of aggregate poverty regardless of which poverty line or poverty measure is used. It may be of interest to note that the difference between urban and rural areas in P_1 is mainly due to the difference in P_0; the average poverty gap of the rural poor (obtained as P_1/P_0) is only slightly higher than that of the urban poor (25 and 28 percent against 24 and 27 percent, respectively, for the lower and higher poverty lines).

iii) In terms of the preferred FGT measure for $\alpha = 2$, the 10 poorest regions (in descending order) for the lower poverty line are rural West Bengal, rural Tamil Nadu, rural Bihar, rural Orissa, rural Meghalaya, urban Tamil Nadu, rural Karnataka, urban Bihar, rural Maharashtra and urban Maharashtra. The same ten regions also turn out to be the poorest using the higher poverty line (although with some re-ranking).[12] These ten regions account for 62.5 and 59.1 percent of aggregate P_2 for the lower and the higher poverty lines, respectively; in contrast, their share in total population is about 40 percent and their share in total number of poor is 52.2 and 49.4 for the lower and higher poverty line, respectively.

iv) The poverty ranking of different regions is found to be quite insensitive to the choice of the poverty measure or the poverty line. The rank correlation coefficients between corresponding poverty measures at the two poverty lines are 0.97, 0.98 and 0.98 for P_0, P_1 and P_2, respectively. For a given poverty line, the rank correlations are also highly significant across the three poverty measures:

	Rank Correlation Coefficient	
	z = 76.65	z = 89.00
(P_0, P_1)	0.96	0.94
(P_1, P_2)	0.97	0.97
(P_0, P_2)	0.90	0.88

v) For all three measures, the inter-regional variation in poverty is greater than that in mean consumption levels (compare the CVs given in the last rows of Tables 1, 2 and 3). It is also notable (though not surprising) that regional disparities in poverty (as measured by the population-weighted coefficient of variation) increase with higher values of α for a given poverty line. For any given α, however, regional poverty variation is lower for the higher poverty line.

vi) As one would expect, the regional profiles of poverty are strongly correlated with average consumptions (negatively) and Gini coefficients (positively) across regions. An OLS regression of the logit of the headcount index against the means and Ginis from Table 1 gives the following result for the lower and higher poverty lines respectively:[13]

$$\log[P_0/(1-P_0)]_i = \underset{(0.65)}{0.0115} - \underset{(26.5)\ [2.78]}{0.0303\ \text{Mean}_i} + \underset{(15.6)\ [1.89]}{8.78\ \text{Gini}_i} \quad R^2=.953,\ n=40$$

and

$$\log[P_0/(1-P_0)]_i = \underset{(7.61)}{1.05} - \underset{(29.8)\ [2.10]}{0.0268\ \text{Mean}_i} + \underset{(13.5)\ [1.09]}{5.96\ \text{Gini}_i} \quad R^2=.960,\ n=40$$

for the higher poverty line. The corresponding absolute elasticities of P_0 with respect to both variables evaluated at mean points are given in squared brackets [ ] below the absolute t-ratios ( ).

4. Regional Disparities and Redistribution: Some Implications for Poverty in India

The Contribution of Regional Disparities to National Poverty

Using the methodology outlined in section 2, we first consider the contribution of inter-regional disparities in mean consumption levels to aggregate poverty in India. This is presented in Table 4. The results show that, given the existing intra-regional consumption distributions, even removing all regional disparities in mean consumption per capita would achieve only a modest reduction of less than two percentage points in the proportion of the population who are deemed to be poor either poverty line. The contribution of disparities in regional means to the aggregate poverty gap measure is somewhat greater at about an 11 percent reduction for the lower poverty line (about 8 percent for the higher poverty line). However, their contribution to aggregatge P_2, the preferred FGT measure of poverty, is virtually zero for either of the two poverty lines. This arises from the nature of underlying inter-regional disparities in intra-regional inequalities, such that eliminating regional disparities in means is sub-optimal from the point of view of poverty alleviation. Complete equalization of regional means would have negligible effect on the severity of aggregate poverty in India, as measured by P_2.

It is important to remind ourselves that we are dealing here only with the direct or first-round effects on poverty. But, while limiting ourselves to those effects, the above results do suggest that the relative thrust of poverty alleviation strategies needs to be on altering intra-regional distributions rather than on equalizing regional means. This

statement needs to be interpreted carefully though. It does not imply that inter-regional transfers are an ineffective instrument in a poverty alleviation strategy; rather, it says that for such transfers to have a greater impact on poverty, they need to rely on their effect on intra-regional distributions rather than their effect on regional disparities per se.

To illustrate this point, we consider another simulation exercise (results reported in the last two columns of Table 4) where existing regional means are kept unchanged, but intra-regional redistributions are considered such that the Gini coefficient in each region is allowed to fall by 5 percent. In particular, per capita consumption of any household h in any region j changes by 5 percent of the difference between mean consumption per capita in region j and h's per capita consumption. Such redistribution, of course, implies a change in region j's Lorenz function. If the new Lorenz parameter vector is deonoted L_j^*, then aggregate poverty P^{**} in Table 4 is defined (using notation introduced in Section 2) as

$$P^{**} = \sum_{j=1}^{m} w_j P(\mu_j, L_j^*)$$

It is obvious from the results in Table 4 that the simulated 5 percent reduction in regional Ginis has a greater impact on poverty than even a full equalization of regional means. The difference is particularly striking for the preferred measured P_2: a 15-20 percent decline in poverty in the former case as compared with a mean zero impact in the latter.

The Qualitative Effect on National Poverty of Reducing Regional Disparities

As we have seen in Section 2 there can be no theoretical presumption that transfers from "rich" to "poor" regions will reduce the proportion of the national population that is poor, or indeed any of the other measures of poverty. Whether they do so or not is an empirical question to which we now turn.

We have tested the necessary and sufficient conditions for desirable redistributions between pairs of regions (Propositions 1 and 2) for each of the 780 distinct binary combinations of the 40 regions. Table 5 summarizes the results for each of the three poverty measures (α=0, 1, 2) and for both additive and multiplicative absorption (Propositions 1 and 2 respectively). The table gives the number of cases in which poverty is reduced by a small transfer for which the donor region has a higher mean than the recipient. We find that at least 74 percent of all additive redistributions and at least 81 percent of all multiplicative redistributions would reduce aggregate poverty.

It also turns out that poverty-reducing redistributions in the additive and multiplicative cases considerably overlap each other, so that at least 73 percent of redistributions are found to be poverty-reducing in both cases. These represent cases where the necessary and sufficient conditions of Propositions 1 and 2 are simultaneously satisfied for any given poverty measure. In other words, the results (in the last 6 rows of Table 5) show that in at least 73 percent of the cases, regional redistributions reduce aggregate poverty irrespectively of whether they are additively or multiplicatively absorbed within regions, or partially absorbed in both ways.

We have also tested the effect of re-distribution from urban to rural areas of each of the twenty states. The results are also summarized in Table 5. Reducing urban-rural disparities in mean consumptions will reduce aggregate poverty in at least 17 out of the 20 states in the additive as well as the multiplicative case. In at least 16 of those states, urban-to-rural redistributions are poverty-reducing whether additively and/or multiplicatively absorbed. The exceptions are mainly found in the states of Andhra Pradesh, Madhya Pradesh and Manipur.

Though exceptions do occur, the overall qualitative result is thus clear - redistribution from India's "rich" states/sectors to her "poor" states/sectors does generally contribute to aggregate poverty alleviation. The further question is begging: how much can poverty be alleviated by such means?

The Quantitative Effect on National Poverty of Reducing Regional Disparities

To give some indication of likely magnitudes we shall consider additive absorption of regional transfers aimed at reducing aggregate poverty, as measured by the FGT measure for $\alpha=2$. As discussed in Section 2 above, such transfers are informationally feasible. The poverty minimizing transfer allocation can then be calculated using the method proposed by Ravallion and Chao (1989); note, again, that we are not prescribing such an allocation, rather it is a natural benchmark for measuring the potential for alleviating poverty by reducing regional disparities in an informationally feasible way. That allocation is given in Table 6 for both

poverty lines. The table also presents summary data on the aggregate effects of regional redistribution on poverty.

A number of observations can be made on the results of Table 4:

i) Out of the 40 state/sector combinations, only 13 are recipients under the poverty minimizing allocation; in decreasing order of importance (in terms of the magnitude of the optimal transfer per capita) for the lower poverty line the recipients are rural West Bengal, rural Tamil Nadu, rural Bihar, rural Orissa, rural Meghalaya, rural Karnataka, urban Tamil Nadu, urban Bihar, rural Maharashtra, urban Maharashtra, urban Uttar Pradesh, urban Karnataka and urban West Bengal. For the higher line, there are 11 recipient regions, all of which are also recepients for the lower line; in decreasing order of importance the recipients are rural West Bengal, rural Bihar, rural Tamil Nadu, rural Orissa, rural Maharashtra, rural Karnataka, urban Bihar, rural Meghalaya, urban Tamil Nadu, urban Uttar Pradesh and urban Maharashtra.

ii) The burden of an optimal redistribution would thus be spread over more than two-thirds of the regions. Nonetheless, the burden reaches a fairly high proportion of average consumption in a few regions, notably urban Meghalaya, rural Jammu and Kashmir, rural Punjab, rural Haryana and urban Himachal Pradesh. It is unlikely that such tax burdens would be politically implementable. Imposing limits on the tax burdens associated with regional redistribution will further constrain the poverty alleviation impact.

iii) Nonetheless, the potential for alleviating aggregate poverty through even "unrestricted" regional redistribution seems quite modest. National poverty falls by about 10-14 percent, though this is difficult to interpret for the P_2 measure. A more useful indicator is probably the

equivalent gain from targeting; recall that this is the increase in average consumption per capita which, if received in the same amount by all regions, would achieve the same reduction in aggregate poverty as that attainable through optimal redistribution across regions. This is given in the last row of Table 6. We find that the maximum reduction in aggregate poverty attainable by regional redistribution could also be achieved by giving every person in India an extra Rs 1.8-2.0 per month, representing a little over 1.5 percent of mean consumption in 1983.

The above results do not offer much encouragement to proponents of regional or sectoral redistribution as a means of alleviating poverty in India; in terms of the direct effects on poverty, the best that could be done by this means alone is modest. To the extent that the informational constraint can be relaxed to allow a greater overall progressivity of redistribution, the impact on poverty alleviation would be greater. But, against this argument, regional redistributions in practice will be further constrained by other economic and political considerations. The net additional effect of these considerations on poverty remains uncertain. However, the above results read in conjunction with those presented in Table 4 (and discussed earlier in this section) do suggest that the immediate potential for poverty alleviation in India by means of inter-regional redistribution is likely to be rather small, unless such redistribution also significantly alters the intra-regional distributions in specific ways.

5. Conclusion

Even if we limit ourselves to the direct effects of regional redistribution, the impact on aggregate poverty is far from obvious. Whether or not redistribution from regions with higher average living standards to those with lower ones, alleviates aggregate poverty depends on the precise form of redistribution, and the nature of existing intra-regional distributions. For example, if intra-regional inequalities cannot be altered, the complete equalization of regional means is only optimal from the point of view of national poverty alleviation if the underlying intra-regional distributions are identical. More generally, regional variations in those distributions moderate (and, sometimes, may even reverse) the case for regional equalization. How regional redistribution affects national poverty is ultimately an empirical question.

Our empirical results for India indicate that small redistributions in which the donor region has a higher mean consumption than the recipient will generally (though not always) lead to a reduction in aggregate poverty. This holds for 73 percent or more of the possible binary redistributions from "rich" to "poor" regions, defined as the urban or rural sectors of each of 20 states. Redistribution from urban to rural sectors will reduce aggregate poverty for at least 16 of those states.

However, our simulations also suggest that the quantitative potential for alleviating poverty through this type of policy intervention in India is quite modest. For example, even in the extreme (and unlikely) case of politically unrestricted, though informationally feasible, redistribution across states and urban/rural sectors of India using lumpsum transfers, the maximum impact on poverty is no more than could be achieved

by simply giving all persons a uniform (untargeted) windfall gain equivalent to about one and a half percent of India's mean consumption level. In practice, it may be possible to relax the informational constraint somewhat. On the other hand, plausible political restrictions on the centre's redistributive powers across states, and also the behavioral responses of households (particularly through their migration possibilities), are likely to allow even less impact on poverty from this type of policy. However, in either case, greater alleviation of poverty will require supplementary interventions which reach the poor within regions, by reducing the costs borne by the poor in donor regions, and/or by enhancing benefits to the poor in recipient regions.

Our results indicate that the direct contribution of inter-regional disparities in average levels of living to aggregate poverty in India is negligible (in terms of the preferred poverty measure) to at best modest (in terms of the headcount index or the poverty gap measure). Any adverse "growth effects" of regional redistribution on the national mean will further reduce the aggregate poverty alleviation impact. Redistributive measures which primarily address disparities in regional mean consumption levels, without any significant desirable effect on existing intra-regional distributions, seem unlikely to have more than a slight impact on aggregate poverty in India. The gains from regional redistribution as part of a poverty alleviation strategy will depend heavily on how intra-regional inequalities are affected.

Appendix: Relevant Analytical Results

Derivatives of Poverty Measures

Here we summarize the analytical properties of FGT poverty measures used in Section 2. Most of these properties are known from recent work (Kanbur, 1987; Ravallion and Chao, 1989; Kakwani, 1989; Thorbecke and Berrian, 1989), though we shall elaborate a little on results for the headcount index and on second derivatives for all measures.

Consider the FGT class of poverty measures whereby poverty in the ith region is

$$P_{\alpha i} = \int_0^z (1-y/z)^{\alpha} f_i(y)dy \qquad \alpha \geq 0 \qquad \text{(A1)}$$

where $f_i(y)$ denotes the probability density of (pre-transfer) income y in region i, and z is the poverty line. For additively absorbed transfers, and the headcount index of poverty ($\alpha=0$), post-transfer poverty in region i is simply

$$P_{0i}(x_i) = \int_0^{z-x_i} f_i(y)dy \qquad \text{(A2)}$$

for which

$$P'_{0i}(x_i) = - f_i(z-x_i) < 0 \qquad \text{(A3)}$$

and

$$P''_{0i}(x_i) = f'_i(z-x_i) \qquad \text{(A4)}$$

which may be positive or negative. Similarly to (A2),

$$P_{\alpha i}(x_i) = \int_0^{z-x_i} \left[\frac{z - y - x_i}{z}\right]^{\alpha} f_i(y)dy \quad \text{for } \alpha \geq 0 \tag{A5}$$

and so

$$P'_{\alpha i}(x_i) = -\frac{\alpha}{z} P_{\alpha-1i} < 0 \qquad (\text{for } \alpha \geq 1) \tag{A6}$$

$$P''_{\alpha i}(x_i) = \frac{\alpha(\alpha-1)}{z^2} P_{\alpha-2i} > 0 \qquad (\text{for } \alpha \geq 2)$$

$$= f_i(z-x_i)/z > 0 \quad (\text{for } \alpha = 1) \tag{A7}$$

Consider instead, the multiplicative case in which the Lorenz curve is held constant. Poverty in each region can be thought of as a function of that region's mean, μ_i. The marginal effect of a change in the mean is then given by

$$P'_{\alpha i}(\mu_i) = -zf_i(z)/\mu_i < 0 \qquad (\text{for } \alpha=0) \tag{A8}$$

$$= (P_{\alpha i} - P_{\alpha-1i})\alpha/\mu_i < 0 \quad (\text{for } \alpha \geq 1)$$

The second derivative is

$$P''_{\alpha i}(\mu_i) = zf_i(z)/\mu_i^2 > 0 \qquad (\text{for } \alpha = 0) \tag{A9}$$

$$P''_{\alpha i}(\mu_i) = [(P'_{\alpha i} - P'_{\alpha-1i})\mu_i - P_{\alpha i} + P_{\alpha-1i}]\alpha/\mu_i^2$$

$$= [P_{\alpha i} - 2P_{\alpha-1i} + P_{\alpha-2i}]\alpha(\alpha-1)/\mu_i^2 > 0 \quad (\text{for } \alpha \geq 1) \tag{A10}$$

noting that P_α is itself a convex function of α. Notice also that $P_{\alpha i}(\mu_i)$ is strictly convex in μ_i for all α. Thus aggregate poverty $\Sigma w_i P_{\alpha i}(\mu_i)$ (where w_i is the population share of the ith region) is a strictly <u>quasi-convex</u> function of the vector of means $(\mu_1,\ldots\mu_m)$. It follows that the

necessary and sufficient conditions for desirable regional redistributions discussed in Section 2 can also be used to characterize optimal regional targeting. It can be shown that a similar result holds for additively absorbed transfers for FGT poverty measures with $\alpha \geq 1$.

Simulations of Poverty Measures

Since (like most researchers) we do not have access to the unit record data from the NSS, simulation is required to estimate poverty measures from the published grouped data. Simulated distributions are also required for the policy simulations. For these purposes we have used Kakwani's (1989) parameterization of the Lorenz curve:

$$L(p) = p - ap^{\gamma}(1-p)^{\delta}e^{\epsilon} \qquad 0 \leq p \leq 1 \tag{A11}$$

which is the cumulative proportion of total income or consumption held by the poorest p proportion of the population. The parameters a, γ and δ are positive, and ϵ is a random error. The parameters γ and δ not exceeding unity is sufficient to ensure convexity of the Lorenz curve. The Lorenz parameters themselves are estimated by OLS for each state/sector from the following regression:

$$\ln[p-L(p)] = \ln a + \gamma \ln p + \delta \ln(1-p) + \epsilon$$

All simulations are at $E\epsilon = 0$. Given the mean and Lorenz function, the distribution function is fully characterized noting that the slope of the generalized Lorenz curve, $L'(p)\mu=x$, is simply the inverse of the distribution function $p=F(x)$. In earlier work on Indonesian data, the

Kakwani parameterization was found to give a better fit than some obvious alternatives (namely the original Kakwani-Podder specification and elliptical Lorenz curves), at least in the crucial lower half of the distribution (Ravallion and Huppi, 1989).

We have then calculated the poverty measures as follows: Since $L'(P_0) = z/\mu$, (A11) implies that:

$$1 - aP_0\gamma(1-P_0)^{\delta}\left[\frac{\gamma}{P_0} - \frac{\delta}{1-P_0}\right] = \frac{z}{\mu} \qquad \text{(A12)}$$

which is solved numerically for P_0 (we used Newton's method). The poverty gap measure P_1 can be written as

$$\begin{aligned} P_1 &= \int_0^{P_0} [1-(\mu/z)L'(p)]dp \\ &= P_0 - (\mu/z)L(P_0) \ . \end{aligned} \qquad \text{(A13)}$$

The FGT measure for $\alpha = 2$ is evaluated as follows. From the definition of P_2 we know that

$$\begin{aligned} P_2 &= \int_0^{P_0} [1-(\mu/z)L'(p)]^2 dp \\ &= (1-\mu/z)^2 P_0 + 2(\mu/z)(1-\mu/z)P_1 \\ &\quad + (\mu/z)^2 \int_0^{P_0} a^2 p^2 \gamma (1-p)^{2\delta} \left[\frac{\gamma^2}{p^2} - \frac{2\gamma\delta}{p(1-p)} + \frac{\delta^2}{(1-p)^2}\right] dp \\ &= (1-\mu/z)^2 P_0 + 2(\mu/z)(1-\mu/z)P_1 \end{aligned}$$

$$+ (a\mu/z)^2[\gamma^2 B(P_0, 2\gamma-1, 2\delta+1) - 2\gamma\delta B(P_0, 2\gamma, 2\delta)$$

$$+ \delta^2 B(P_0, 2\gamma+1, 2\delta-1)] \qquad \text{(A14)}$$

where $B(k,m,n) = \int_0^k p^{m-1}(1-p)^{n-1}dp$. (Several software packages allow one to evaluate this using incomplete beta functions.) Thus, given (μ, a, γ, δ) for any region, the FGT poverty measures for any poverty line are calculated from (A12), (A13) and (A14). The probability densities at the poverty line (as required by Propositions 1 and 2 and for calculating η_0) are readily estimated using the fact that $f(z) = 1/(\mu L''(P_0))$.

NOTES

1. For recent discussions see Mishra (1985), Bhattacharya et al (1987), Sundaram (1987), Dev (1988), Jain et al. (1988), Sundaram and Tendulkar (1988), and Prasad (1988). On sectoral policies and their implications for the poor see Lipton (1977).

2. See GOI (1988). The specific formula used by the Finance Commission is somewhat contentious; see, for example, Arun (1989).

3. This has been a theme of recent analytical work on poverty alleviation policies; for further discussion and empirical examples see Kanbur (1987), Besley and Kanbur (1988), Ravallion and Chao (1989), Ravallion (1989a,b) and Glewwe (1989). Ravallion (1989b) has examined the potential for poverty alleviation through regional targeting in Indonesia, recognizing explicitly that the policy maker is constrained by (often highly) imperfect information on individual incomes.

4. Ravallion (1989b) discusses how the present methodology can be adapted to incorporate effects on pre-transfer incomes, though empirical implementation looks difficult. The possibilities for adverse general equilibrium effects on incomes of the rural poor arising from attempts to redistribute incomes from the urban to the rural sector are discussed in Ravallion (1984). For an interesting approach to this problem using social accounting matrices see Thorbecke and Berrian (1989).

5. The results for $\alpha \geq 1$ used in Propositions 1 and 2 can be found in recent literature, particularly following Kanbur (1987). The appendix summarizes relevant analytical results from which these propositions can be readily proved, including the properties claimed here for $\alpha=0$.

6. The approach follows Ravallion and Chao (1989). Also see Ravallion (1989b) for further discussion..

7. Sub-state level data beyond the urban/rural split is not available (the most recent available sub-state level distributional data from the NSS appears to be 1973-74). But state level analysis is probably of greater interest in this context, since state level disbursements are the centre's main policy instrument for regional redistribution. A few states and union territories were excluded on account of data gaps or in view of their extremely small share in national population.

8. Using the ICRISAT panel data for three villages in India's semi-arid tropics, Ravallion (1988) finds that variability over time (particularly in crop and labor incomes) is an important contributing factor to poverty in the long-run, as measured by the expected value of distributionally sensitive FGT measures (though the contribution to the expected value of the headcount index is small). Inter-sectoral transfers may thus be one way to alleviate aggregate poverty by reducing income variability in the rural sector. Indeed, this is arguably an important function of Maharashtra's famous "Employment Guarantee Scheme", which finances agricultural work in lean seasons by taxes on that state's urban sector.

9. Some researchers have preferred to use the interstate price deflator estimated by Bardhan (1974). This does, however, have some disadvantages for our purposes: Bardhan's data are for the early 1960s and only cover rural areas, and not even for all states. Rural price indices for 1983 based on Bardhan's data do, however, turn out to quite strongly correlated with those based on Bhattacharya et al. (1987) when both are up-dated by the CPIAL ($r = 0.83$ across the 15 comparable states). The interstate variability in real mean consumption is higher using the deflator based on Bardhan's study, though the difference is small (a population weighted CV of 4.2%, versus 3.7% when based on Bhattacharya et al).

10. The appropriateness of CPIAL and CPIIW as price deflators for poverty analysis has been recently questioned by Minhas et al. (1987, 1988) who also develop alternative price indices for the rural and urban middle three deciles. However, their study does not provide state-wise price indices for rural areas, and in the event, using CPIAL and CPIIW seems to be the best that one can do.

11. The Minhas price index applied to the Dandekar-Rath line gives a 1983 poverty line within our interval.

12. The poverty estimates for rural Jammu and Kashmir (J&K) are lower than would be expected a priori; J&K is a relatively poor state by several socio-economic indicators, such as the rates of literacy or infant mortality. The lower poverty estimates are largely the result of a 'high' value of real mean consumption; 29.2 percent higher than mean consumption for rural India at 1983 all-India rural prices. But, even in terms of current prices, mean consumption for rural J&K is 14.5 percent higher than that for rural India. The rest is, of course, accounted for by the difference in rural J&K and rural India. It could well be that the inter-state price relative constructed by Bhattacharya et al. (1980), which we use in this study, underestimates prices in rural J&K relative to other regions. However, as other studies of inter-state price variation have a much small regional coverage, we are unable to further address this issue.

13. These regressions should be interpreted as simplified representations of the underlying statistical relationship between these variables; all three variables (poverty measure, mean, and Gini) are of course derived from the same distribution. A dummy variable for urban areas was also tested but proved highly insignificant. Note that the logit transform avoids the truncation which arises in using P_0 as the dependent variable (being bounded in the 0, 1 interval). This specification comfortably passed a Ramsey RESET test on functional form. Details are available from the authors.

REFERENCES

Arun, T.K. 1989. "Poverty Ratio as a Devolution Criterion. A Note." Economic and Political Weekly 24:319-321

Bardhan, Pranab K. 1974. "On the Incidence of Poverty in Rural India in the Sixties." In P.K. Bardhan and T.N. Srinivasan (eds.) Poverty and Income Distribution in India, Statistical Publishing Society, Calcutta.

Besley, T., and Ravi Kanbur. 1989. "Principles of Targeting", DERC Working Paper, University of Warwick.

Bhattacharya, N., G.S. Chatterjee, and Padmaja Pal. 1987. "Variations in Level of Living Across Regions and Social Groups in Rural India, 1963/64 and 1973/74." In T. N. Srinivasan and P. Bardhan (eds.) Rural Poverty in South Asia, Columbia University Press, New York.

Bhattacharya, N., P.D. Joshi, and A. B. Roychoudhury. 1980. Regional Price Indices Based on NSS 28th Round Consumer Expenditure Survey Data, Sarvekshana, 3:107-121.

Dev, S.M. 1988. "Regional Disparities in Agricultural Labor Productivity and Rural Poverty in India." Indian Economic Review 23: 167-205.

Foster, James E., J. Greer and Erik Thorbecke. 1984. "A Class of Decomposable Poverty Measures." Econometrica 52: 761-66.

Glewwe, Paul, 1989. "Targeting Assistance to the Poor: Efficient Allocation of Transfers when Household Incomes are Unobservable," mimeo, Welfare and Human Resources Division, World Bank.

Government of India (GOI) 1988. First Report of the Ninth Finance Commission, Government of India, Delhi.

Jain, L.R., K. Sundaram, and S.D. Tendulkar. 1988. "Dimensions of Rural Poverty: An Inter-Regional Profile." Economic and Political Weekly 13: 2395-2408.

Kakwani, Nanak. 1989. "Poverty and Economic Growth with Application to Cote d'Ivoire," mimeo, Welfare and Human Resources Division, World Bank.

Kanbur, S.M. Ravi. 1987. "Measurement and Alleviation of Poverty." IMF Staff Papers 34: 60-85

Lipton, M. 1977, Why Poor People Stay Poor, Temple Smith, London.

Minhas, B. S. et al. 1987. "On the Choice of Appropriate Consumer Price Indices and Data Sets for Estimating the Incidence of Poverty in India," Indian Economic Review, 12: 19-49.

Minhas, B. S. et al. 1988. "Measurement of General Cost of Living for Urban India: All-India and Different States," Sarvekshana, 12: 1-23.

Mishra, G. (ed.) 1985. Regional Structure of Development and Growth in India. Ashish Publishing House, Delhi.

National Sample Survey Organization (NSSO) 1986. "A Report on the Third Quinquennial Survey on Consumer Expenditure, NSS 38th Round". Sarvekshana 9: S1-S102.

Prasad, Pradhan H. 1988. "Roots of Uneven Regional Growth in India." Economic and Political Weekly 23: 1689-1692.

Ravallion, Martin, 1984. "How Much is a Transfer Payment Worth to a Rural Worker?" Oxford Economic Papers 36:478-489.

Ravallion, Martin, 1988. "Expected Poverty Under Risk Induced Welfare Variability". The Economic Journal 98: 1171-1182.

Ravallion, Martin, 1989a. "Land-Contingent Poverty Alleviation Schemes." World Development, 17: 1223-1233.

Ravallion, Martin. 1989b. "Poverty Alleviation Through Regional Targeting: a Case Study for Indonesia." World Bank Conference on Agricultural Policies and the Theory of Rural Organization.

Ravallion, Martin and Kalvin Chao, 1989. "Targeted Policies for Poverty Alleviation Under Imperfect Information: Algorithms and Applications." Journal of Policy Modeling 11:213-224.

Ravallion, Martin and Monika Huppi, 1989. "Poverty and Undernutrition in Indonesia During the 1980s." PPR Working Paper, World Bank.

Registrar General and Census Commissioner of India (RGCCI) 1982. Final Population Totals, Census of India 1981, Series - 1, India, Paper - 1 of 1982, Controller of Publications, Delhi.

Sen, Amartya K., 1976. "Poverty: an Ordinal Approach to Measurement." Econometrica 48:437-446.

Sundaram, K., and Suresh D. Tendulkar, 1988. "Toward an Explanation of Interregional Variations in Poverty and Unemployment in Rural India." In T.N. Srinivasan and P. Bardhan (eds.) Rural Poverty in South Asia, Columbia University Press, New York.

Sundrum, R.M. 1987. Growth and Income Distribution in India. Policy and Performance since Independence, Sage Publications, New Delhi.

Thorbecke, Erik and David Berrian, 1989. "Budgetary Rules to Minimize Societal Poverty", mimeo, Cornell University.

Table 1: Summary Data on Regional Disparities 1983

State	Urban			Rural			Total	
	Pop. share	Mean	Gini	Pop. share	Mean	Gini	Pop. share	Mean
Andhra Pradesh	1.92	137.46	0.310	6.01	134.84	0.296	7.92	135.47
Assam	0.32	121.37	0.259	2.67	102.90	0.201	2.99	104.86
Bihar	1.35	107.29	0.304	9.01	87.59	0.260	10.36	90.16
Gujarat	1.61	116.62	0.271	3.47	108.85	0.259	5.08	111.32
Haryana	0.44	147.33	0.315	1.49	150.38	0.276	1.93	149.68
Himachal Pradesh	0.05	191.22	0.355	0.58	131.59	0.277	0.63	136.21
Jammu and Kashmir	0.19	113.73	0.247	0.70	145.77	0.230	0.90	138.86
Karnataka	1.65	129.99	0.339	3.88	107.82	0.304	5.53	114.44
Kerala	0.72	144.00	0.387	3.02	130.42	0.338	3.74	133.04
Madhya Pradesh	1.64	118.40	0.298	6.11	117.17	0.297	7.75	117.43
Maharashtra	3.34	130.16	0.342	5.97	102.96	0.286	9.31	112.71
Manipur	0.07	103.63	0.176	0.15	112.51	0.187	0.22	109.86
Meghalaya	0.04	172.05	0.269	0.16	110.05	0.299	0.20	121.73
Orissa	0.49	125.46	0.303	3.40	91.92	0.271	3.89	96.15
Punjab	0.71	145.63	0.335	1.78	170.13	0.289	2.49	163.14
Rajasthan	1.12	124.38	0.307	4.03	145.05	0.346	5.15	140.55
Tamil Nadu	2.38	119.20	0.356	4.72	103.06	0.328	7.09	108.47
Tripura	0.03	140.13	0.331	0.27	119.16	0.256	0.31	121.49
Uttar Pradesh	3.10	116.77	0.315	13.37	118.05	0.295	16.47	117.81
West Bengal	2.16	126.12	0.338	5.91	89.22	0.289	8.07	99.12
All-India	23.32	125.12		76.68	112.86		100.00	115.72
Population-weighted coefficient of variation		8.23			17.35			14.32

Note: All mean values are in Rs at 1983 all-India rural prices.

Table 2: Poverty in India 1983

(Poverty line = Rs 76.65)

State	Urban			Rural			Total		
	P0	P1	P2	P0	P1	P2	P0	P1	P2
Andhra Pradesh	20.93	4.53	1.52	20.36	4.28	1.40	20.50	4.34	1.43
Assam	22.27	3.97	1.06	26.24	4.26	1.08	25.82	4.23	1.07
Bihar	38.27	9.86	3.46	49.43	13.13	4.80	47.98	12.71	4.62
Gujarat	26.76	4.81	1.27	30.49	5.89	1.68	29.31	5.55	1.55
Haryana	17.40	3.32	0.99	11.56	1.94	0.55	12.89	2.26	0.65
Himachal Pradesh	11.08	2.21	0.72	17.88	2.86	0.72	17.36	2.81	0.72
Jammu and Kashmir	24.85	3.75	0.84	5.57	0.65	0.14	9.73	1.32	0.29
Karnataka	29.36	7.67	2.82	37.13	10.01	3.75	34.81	9.31	3.47
Kerala	27.87	6.80	2.42	27.87	6.03	1.91	27.87	6.18	2.01
Madhya Pradesh	30.22	6.25	1.82	30.50	6.95	2.26	30.44	6.81	2.17
Maharashtra	29.83	8.03	3.02	38.97	9.83	3.42	35.69	9.18	3.28
Manipur	17.18	4.15	2.58	17.48	2.56	0.59	17.39	3.04	1.19
Meghalaya	5.10	0.73	0.19	35.28	10.06	3.89	29.59	8.30	3.19
Orissa	26.31	5.60	1.74	45.06	12.35	4.80	42.69	11.50	4.41
Punjab	21.54	4.49	1.37	7.67	1.13	0.29	11.62	2.09	0.60
Rajasthan	27.05	6.17	2.09	23.23	5.33	1.79	24.06	5.51	1.86
Tamil Nadu	36.11	9.80	3.81	43.08	12.50	5.04	40.74	11.59	4.63
Tripura	22.94	5.27	1.81	23.07	4.21	1.16	23.06	4.33	1.24
Uttar Pradesh	32.95	7.90	2.70	29.51	6.61	2.14	30.15	6.85	2.25
West Bengal	30.63	7.66	2.73	47.96	15.01	6.52	43.31	13.04	5.51
All-India	29.48	7.10	2.48	33.61	8.39	3.03	32.65	8.09	2.90
Population-weighted coefficient of variation	17.15	25.75	32.97	32.76	45.56	56.30	28.80	40.40	49.78

Note: All poverty measures are expressed as percentages.

Table 3: Poverty in India 1983

(Poverty line = Rs 89.00)

State	Urban			Rural			Total		
	P0	P1	P2	P0	P1	P2	P0	P1	P2
Andhra Pradesh	30.81	7.49	2.68	30.32	7.20	2.52	30.44	7.27	2.56
Assam	34.29	7.34	2.24	42.44	8.44	2.43	41.58	8.32	2.41
Bihar	49.28	14.58	5.73	62.48	19.10	7.74	60.76	18.52	7.48
Gujarat	40.05	8.79	2.70	44.43	10.28	3.33	43.04	9.81	3.13
Haryana	26.93	5.93	1.92	20.14	3.86	1.15	21.69	4.33	1.32
Himachal Pradesh	17.58	3.89	1.32	29.79	5.77	1.64	28.85	5.62	1.62
Jammu and Kashmir	39.78	7.73	2.10	14.00	1.87	0.42	19.56	3.14	0.78
Karnataka	38.61	11.33	4.55	47.88	14.53	5.96	45.11	13.57	5.54
Kerala	37.76	10.42	4.02	39.07	9.85	3.47	38.82	9.96	3.58
Madhya Pradesh	42.06	10.41	3.50	41.71	11.01	4.00	41.78	10.88	3.90
Maharashtra	38.82	11.68	4.79	50.71	14.70	5.72	46.45	13.62	5.38
Manipur	31.79	6.91	3.32	30.56	5.53	1.47	30.93	5.94	2.02
Meghalaya	11.09	1.72	0.45	44.79	14.23	6.03	38.44	11.87	4.98
Orissa	37.29	9.24	3.21	57.74	17.79	7.46	55.16	16.71	6.93
Punjab	30.96	7.51	2.57	14.72	2.51	0.67	19.35	3.94	1.21
Rajasthan	37.90	9.83	3.62	32.37	8.45	3.11	33.58	8.75	3.22
Tamil Nadu	46.80	14.21	5.94	54.06	17.52	7.63	51.63	16.41	7.06
Tripura	32.39	8.38	3.11	35.33	7.68	2.39	35.01	7.76	2.47
Uttar Pradesh	44.19	12.17	4.60	40.85	10.58	3.81	41.48	10.88	3.96
West Bengal	40.82	11.56	4.51	59.34	20.39	9.42	54.37	18.02	8.11
All-India	40.03	10.94	4.17	45.07	12.70	4.97	43.90	12.29	4.79
Population-weighted coefficient of variation	13.46	20.47	26.92	26.46	38.21	47.85	23.05	33.68	42.28

Note: All poverty measures are expressed as percentages.

Table 4: Contribution of Regional Disparities in Means to Aggregate Poverty and the Effects of Reducing Intra-Regional Inequalities

Poverty measure (P_α)	Poverty line (z)	Actual poverty (P)	Simulated poverty with equal means (P^*)	Contribution of unequal means to poverty $(1-P^*/P)x100$	Simulated poverty with 5% reduction in Ginis (P^{**})	Percent reduction in poverty $(1-P^{**}/P)x100$
Headcount index (α=0)	76.65	32.65	30.91	5.33	30.85	5.51
	89.00	43.90	42.26	3.74	42.73	2.67
Poverty gap (α=1)	76.65	8.09	7.16	11.12	7.00	13.47
	89.00	12.29	11.28	8.22	11.14	9.36
Preferred measure(α=2)	76.65	2.90	2.90	0.07	2.31	20.20
	89.00	4.79	4.79	0.01	4.06	15.20

Table 5: Effects of Regional Redistribution on Aggregate Poverty

Poverty measure (P_α)	Redistribution across all region/sectors		Redistribution from urban to rural sectors	
	Decreases poverty	Increases poverty	Decreases poverty	Increases poverty
Additively absorbed redistribution				
		z = 76.65		
Headcount index (P_0)	664(85)	116(15)	18	2
Poverty gap (P_1)	619(79)	161(21)	18	2
Preferred measure (P_2)	576(74)	204(26)	17	3
		z = 89.00		
Headcount index (P_0)	594(76)	186(24)	18	2
Poverty gap (P_1)	658(84)	122(16)	18	2
Preferred measure (P_2)	600(77)	180(23)	17	3
Multiplicatively absorbed redistribution				
		z = 76.65		
Headcount index (P_0)	725(93)	55(7)	19	1
Poverty gap (P_1)	675(87)	105(13)	17	3
Preferred measure (P_2)	629(81)	151(19)	18	2
		z = 89.00		
Headcount index (P_0)	690(88)	90(12)	18	2
Poverty gap (P_1)	727(93)	53(7)	19	1
Preferred measure (P_2)	659(84)	121(16)	18	2
Additively or multiplicatively absorbed redistribution				
		z = 76.65		
Headcount index (P_0)	664(85)	116(15)	13	2
Poverty gap (P_1)	617(79)	163(21)	17	3
Preferred measure (P_2)	571(73)	209(27)	16	4
		z = 89.00		
Headcount index (P_0)	594(76)	186(24)	18	2
Poverty gap (P_1)	656(84)	124(16)	18	2
Preferred measure (P_2)	598(77)	182(23)	16	4

Note: The table gives the number of pairs between which small redistributions from the higher mean to the lower mean regions will decrease aggregate poverty, and the number for which poverty increases. Corresponding percentages are given in parentheses.

Table 6: Poverty Minimizing Regional Redistributions

State	Poverty Line z = 76.65 Urban	z = 76.65 Rural	z = 89.00 Urban	z = 89.00 Rural
Andhra Pradesh	-9.01	-9.86	-10.42	-11.19
Assam	-9.77	-7.71	-9.70	-6.04
Bihar	5.25	10.12	5.70	11.87
Gujarat	-6.57	-3.59	-5.78	-2.52
Haryana	-13.82	-21.83	-15.32	-23.68
Himachal Pradesh	-23.16	-14.14	-27.21	-14.17
Jammu and Kashmir	-9.20	-30.61	-7.77	-31.08
Karnataka	0.68	5.77	-0.57	5.77
Kerala	-1.65	-3.58	-2.67	-3.78
Madhya Pradesh	-2.83	-1.13	-2.42	-1.20
Maharashtra	1.61	5.90	0.24	5.78
Manipur	-10.73	-14.74	-10.52	-14.09
Meghlaya	-35.13	6.18	-37.79	5.51
Orissa	-4.87	9.54	-5.26	10.52
Punjab	-8.97	-29.39	-10.40	-32.05
Rajasthan	-3.34	-6.25	-3.94	-7.91
Tamil Nadu	5.45	10.24	5.24	10.69
Tripura	-6.46	-8.92	-8.05	-8.77
Uttar Pradesh	1.15	-2.02	1.20	-2.12
West Bengal	0.62	14.34	-0.04	14.92
Actual poverty	2.90		4.79	
Minimum poverty	2.48		4.29	
Equivalent gain (Rp/mn)	1.99		1.81	

Note: The table gives the gain or loss to each region which minimizes aggregate poverty such that population weighted aggregate gains match losses. All monetary units are Rs per capita per month at 1983 all-India rural prices. The poverty measure is P_2.

Figure 1: Effects on aggregate poverty of urban-rural redistribution

(Poverty line less than mode)

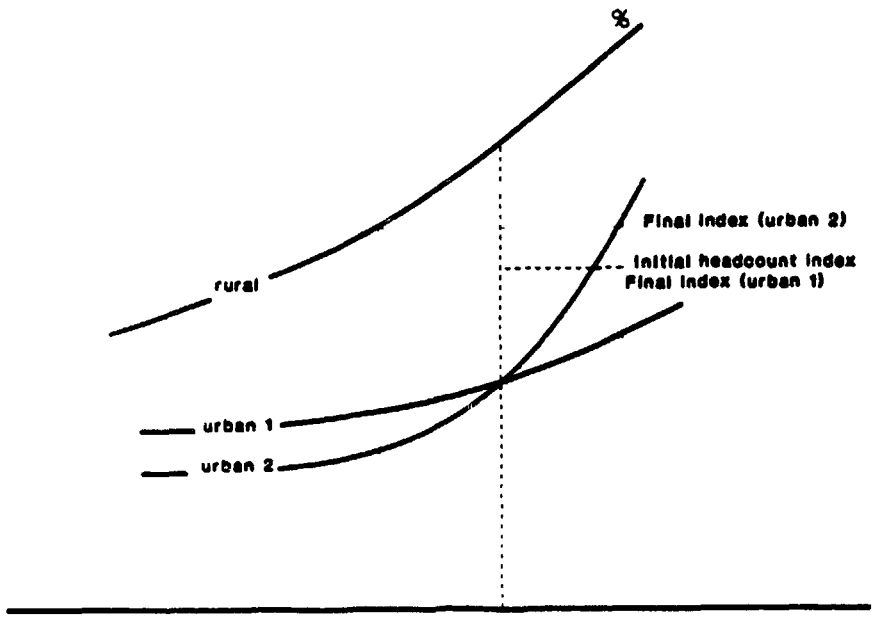
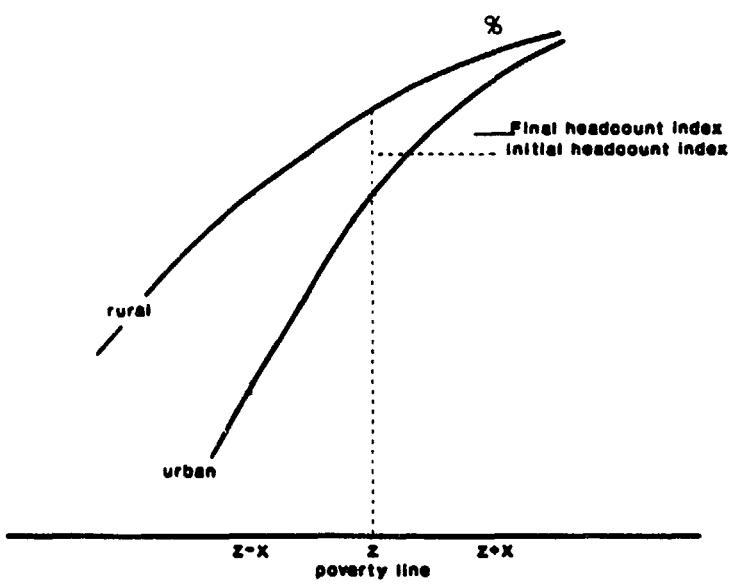


Figure 2: Effects on aggregate poverty of urban-rural redistribution

(Poverty line greater than mode)



PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS360	Compounding Financial Repression with Rigid Urban Regulations: Lessons of the Korea Housing Market	Bertrand Renaud	January 1990	L. Victorio 31009
WPS361	Housing and Labor Market Distortions in Poland: Linkages and Policy Implications	Stephen K. Mayo James I. Stein	January 1990	L. Victorio 31009
WPS362	Urban Property Taxation: Lessons from Brazil	William Dillinger	January 1990	L. Victorio 31009
WPS363	Paying for Urban Services: A Study of Water Vending and Willingness to Pay for Water in Onitsha, Nigeria	Dale Whittington Donald T. Lauria Xinming Mu	January 1990	L. Victorio 31009
WPS364	Financing Urban Services in Latin America: Spatial Distribution Issues	Gian Carlo Guarda	January 1990	L. Victorio 31009
WPS365	Cost and Benefits of Rent Control in Kumasi, Ghana	Stephen Malpezzi A. Graham Tipple Kenneth G. Willis	January 1990	L. Victorio 31009
WPS366	Inflation, Monetary Balances, and the Aggregate Production Function: The Case of Colombia	Robert Buckley Anupam Dokeniya	January 1990	L. Victorio 31009
WPS367	The Response of Japanese and U.S. Steel Prices to Changes in the Yen-Dollar Exchange Rate	Panos Varangis Ronald C. Duncan	March 1990	D. Gustafson 33714
WPS368	Enterprise Reform in Socialist Economies: Lease Contracts Viewed as a Principal-Agent Problem	Guttorm Schjelderup		
WPS369	Cost Recovery Strategy for Rural Water Delivery in Nigeria	Dale Whittington Apia Okorafor Augustine Akore Alexander McPhail	March 1990	V. David 33736
WPS370	Export Incentives, Exchange Rate Policy, and Export Growth in Turkey	Ismail Arslan Sweder van Wijnbergen		
WPS371	Tariff Valuation Bases and Trade Among Developing Countries ... Do Developing Countries Discriminate Against Their Own Trade?	Refik Erzan Alexander Yeats	February 1990	J. Epps 33710
WPS372	Long-Term Outlook for the World Economy: Issues and Projections for the 1990s	Shahrokh Fardoust Ashok Dhareshwar	February 1990	J. Queen 33740

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS373	Are Better-off Households More Unequal or Less Unequal?	Lawrence Haddad Ravi Kanbur	March 1990	J. Sweeney 31021
WPS374	Two Sources of Bias in Standard Partial Equilibrium Trade Models	Samuel Laird Alexander J. Yeats	February 1990	J. Epps 33710
WPS375	Regional Disparities, Targeting, and Poverty in India	Gaurav Datt Martin Ravallion	March 1990	C. Spooner 30464
WPS376	The World Economy in the Mid-1990s: Alternative Patterns of Trade and Growth	Colin I. Bradford, Jr.		
WPS377	Security for Development in a Post-Bipolar World	John Stremlau		
WPS378	How Does the Debt Crisis Affect Investment and Growth? A Neoclassical Growth Model Applied to Mexico	Patricio Arrau		
WPS 379	Implications of Policy Games for Issues of High Inflation Economies	Miguel A. Kiguel Nissan Liviatan		
WPS380	Techniques for Railway Restructuring	Lee W. Huff Louis S. Thompson	March 1990	S. Shive 33761
WPS381	Trade in Banking Services: Issues for Multilateral Negotiations	Alan Gelb Silvia Sagari	March 1990	W. Pitayatonakarn 37666
WPS382	The Indonesian Vegetable Oils Sector: Modeling the Impact of Policy Changes	Donald F. Larson	March 1990	D. Gustafson 33714
WPS383	On the Relevance of World Agricultural Prices	Yair Mundlak Donald F. Larson	March 1990	D. Gustafson 33714
WPS384	A Review of the Use of the Rational Expectations: Hypothesis in Models of Primary Commodity Prices	Christopher L. Gilbert		
WPS385	The Principles of Targeting	Timothy Besley Ravi Kanbur	March 1990	J. Sweeney 31021
WPS386	Argentina's Labor Markets in an Era of Adjustment	Luis A. Riveros Carlos E. Sanchez	March 1990	R. Luz 39059
WPS387	Productivity and Externalities: Models of Export-Led Growth	Jaime de Melo Sherman Robinson	March 1990	M. Ameal 37947